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Practitioner's Docket No.: 791_130 RCE

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the application of: Li YANG and Toshihiro YOSHIDA

Ser. No.: 09/770,725

Group Art Unit: 1745

Filed: January 26, 2001

Examiner: Jonathan Crepeau

Confirmation No.: 6015

For: LITHIUM SECONDARY BATTERY

Mail Stop Appeal Brief-Patents
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Janet M. Stevens
Janet M. Stevens

TRANSMITTAL OF REPLY BRIEF

Sir:

Transmitted herewith are three copies of a Reply Brief for the above-referenced application.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,

BURR & BROWN

Kevin C. Brown

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October 19, 2006

Date

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Enclosures: Reply Brief (3)

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REPLY BRIEF

Sir:

The following remarks are submitted in response to the "Supplemental Examiner's Answer" dated August 22, 2006.

On page 2 of the Supplemental Examiner's Answer, item "(6)", there is a statement that "[T]he appellant's statement of the grounds of rejection to be reviewed on appeal is correct" and that "... the rejection grounds presented in this Answer are considered to constitute a new ground of rejection ...".

It is believed that the reference to "the appellant's statement of the grounds of rejection" refers to the "Grounds of Rejection" set forth in the Appeal Brief filed on November 14, 2005, page 7, item "VI", where the rejection in the Final Office Action dated January 14, 2005 (namely, a rejection of claims 1-17 under 35 U.S.C. §103(a) over Takami '544 in view of Watanabe '644) is referenced. It is not clear from the Supplemental Examiner's Answer whether the rejection over Takami '544 in view of Watanabe '644 has been withdrawn in favor of the new rejection, or whether the rejection over Takami '544 in view of Watanabe '644 is being maintained in addition to the new rejection. In any event, the appellant's comments regarding the rejection over Takami '544 in view of Watanabe '644 are contained in the Appeal Brief filed November 14, 2005 and the Reply Brief filed February 21, 2006, and it is believed that those arguments demonstrate that the rejection over Takami '544 in view of Watanabe '644 should be reversed.

The Supplemental Examiner's Answer contains a new ground of rejection, namely, claims 1-17 are rejected under 35 U.S.C. §103(a) over Takami '544 in view of Watanabe '644, further in view of Kurose '822.

The present invention is directed to a lithium secondary battery comprising an electrode unit produced by winding or laminating a positive electrode and a negative electrode via a separator, and a non-aqueous electrolytic solution. The positive electrode comprises active substance comprising lithium manganese oxide. The negative electrode comprises active substance comprising amorphous carbonaceous material and/or graphitized carbonaceous material.

According to the present invention, a cumulative concentration of water released from the positive and negative electrodes in relation to the weight of the electrode unit, exclusive of the weight of the current collectors, is 5,000 ppm or lower in the case of heating both electrodes at 25 to 200°C, and 1,500 ppm or lower in the case of heating the electrodes at 200 to 300°C.

Takami '544 is directed to a lithium secondary battery having, according to the patent, an improved negative electrode containing a carbonaceous material (Takami '544, column 1, lines 9-12). The carbonaceous material has a region of amorphous carbon structure and a region of graphite structure, and has specific properties relating to density and X-ray diffraction. The positive electrode active material of Takami '544 can be any of various kinds of oxides, and a listing of types of oxides appears in Takami '544, column 4, lines 39-49.

In the Supplemental Examiner's Answer, page 4, lines 1-2, the U.S. PTO acknowledges that Takami '544 does not disclose the water content of the electrodes as described above (i.e., a cumulative concentration of water released from the positive and negative electrodes in relation to the weight of the electrode unit, exclusive of the weight of the current collectors, is 5,000 ppm or lower in the case of heating both electrodes at 25 to 200°C, and 1,500 ppm or lower in the case of heating the electrodes at 200 to 300°C).

Watanabe '644 discloses a non-aqueous electrolyte secondary battery which uses Li_xSiO_y as the negative electrode active material and $\text{Li}_x\text{Ti}_y\text{O}_4$ or Li_xFeS_y as the positive electrode active material (Watanabe '644, Abstract). The materials disclosed in Watanabe '644 for use as the positive and negative electrodes do not include any materials disclosed in Takami '544 for use as the positive and negative electrodes of Takami '544.

Watanabe '644 contains no suggestion that any of the features disclosed therein which relate to avoidance of moisture would provide any benefit in batteries which do not employ positive and negative active materials as disclosed in Watanabe '644. Watanabe '644 discloses that it is desirable that "*the battery of the present invention*" be assembled in a moisture-free atmosphere or an inert gas atmosphere. Any assertion that Watanabe '644 suggests reducing moisture content in *all* lithium secondary batteries, regardless of the electrode active materials, would go beyond what is disclosed in Watanabe '644.

The Examiner's Answer contains a statement that ". . . in column 14, lines 48-52, Watanabe et al. teach that a positive electrode mixture and a negative electrode mixture both have moisture contents of 50 ppm or less" (Supplemental Examiner's Answer, page 4, lines 8-9). Immediately following the statement quoted in the preceding sentence, the Examiner's Answer contains the statement "[t]herefore, the invention as a whole would have been obvious . . . because the disclosure of Watanabe et al. would motivate the artisan to use electrodes having a moisture content of less than 50 ppm in the battery of Takami et al." (Supplemental Examiner's Answer, page 4, lines 10-13). The U.S. PTO, however, has not provided any basis for asserting that one of skill in the art would have been motivated to attempt to modify the batteries disclosed in Takami '544 by looking to Watanabe '644 in the manner asserted in the Examiner's Answer. Moreover, the respective references, Takami '544 and Watanabe '644, do not contain disclosure which would have provided such motivation.

Kurose '822 is directed to a method for producing an electrode for a non-aqueous electrolyte battery, and more particularly, to a method for producing a non-aqueous electrolyte battery electrode which includes an electrode active material layer containing at least an active material having a composition of $\text{Li}_x \text{Ni}_y \text{M}_z \text{O}_2$ (where x satisfies $0.8 < x < 1.5$, $y+z$ satisfies $0.8 < y+z < 1.2$, z satisfies $0 \leq z < 0.35$, and M is at least one element selected from Co, Mg, Ca, Sr, Al, Mn and Fe).

Kurose '822 does not contain disclosure which would suggest to one of skill in the art that disclosure in Watanabe '644 about the electrodes therein would be broadly applicable to *all* electrodes. As noted above, Watanabe '644 discloses a battery in which a negative electrode active has the compositional formula $\text{Li}_x \text{SiO}_y$, and a positive electrode active material is represented by the general formula $\text{Li}_x \text{Ti}_y \text{O}_4$ or $\text{Li}_x \text{FeS}_y$.

In the Supplemental Examiner's Answer, page 4, line 18 - page 5, line 1, there are statements that "[t]he reference [Kurose '822] discloses . . . that '[u]se of an active material in a state with a lot of absorbed moisture in battery causes problems such as decrease in a charge/discharge capacity of the battery, increase in internal resistance, and deterioration of the preservation property' [Kurose '822, col. 2, lines 14-18]", and that "[a]s such, the Kurose patent is taken as evidence that water management is a known problem in lithium secondary batteries, regardless of the specific electrode materials."

As noted above, the present claims recite specific water concentrations (namely, cumulative concentration of water released from the positive and negative electrodes in relation to the weight of the electrode unit, exclusive of the weight of the current collectors, is 5,000 ppm or lower in the case of heating both electrodes at 25 to 200°C, and 1,500 ppm or lower in the case of heating the electrodes at 200 to 300°C). Kurose '822 refers to *a lot of* absorbed moisture. Kurose '822 does not quantify how much moisture is considered to be "a lot" of moisture. Similarly, Kurose '822 states that ". . . the active material can be supplied in a state of *low* water content . . ." (Kurose '822, col. 5, lines 3-4 – emphasis added) and that ". . . it is possible to avoid decrease in the battery capacity, increase in the internal resistance, and deterioration the [sic] preservation properties that are caused by a *high* water content in the positive electrode active material . . ." (Kurose '822, col. 5, lines 21-25 – emphasis added).

As noted above, the U.S. PTO acknowledges that Takami '544 does not disclose the water content of the electrodes. In addition, as detailed above, Kurose '822 does not give any water concentration values. The U.S. PTO attempts to justify the new rejection by referring to the water concentration values disclosed in Watanabe '644 and apply those values to the materials in the batteries disclosed in Takami '544, even though the materials disclosed in Watanabe '644 for use as the positive and negative electrodes do not include any materials disclosed in Takami '544 for use as the positive and negative electrodes of Takami '544, and even though Watanabe '644 contains no suggestion that any of the features disclosed therein which relate to avoidance of moisture would provide any benefit in batteries which do not employ positive and negative active materials as disclosed in Watanabe '644. Such use of the present application as a template to fit in otherwise unrelated disclosures in the prior art is unfair to the applicants and should not be permitted by the Honorable Board.

In lines 4-6 of the first full paragraph on page 6 of the Supplemental Examiner's Answer, there is a statement that ". . . regardless of the affinity of the carbonaceous material of Takami for absorbing water, the artisan would still have motivation, stated above, for making the electrode as water-free as possible." It is respectfully pointed out that the amount of water which can be tolerated depends on the specific positive and negative active materials, and that the U.S. PTO has not established that persons of skill in the art would be motivated to make the electrode *as water-free as possible*.

In addition, none of the applied references contains any indication that the battery of Takami '544 could be made to have the water content properties disclosed in Watanabe '644, unless the battery were to include a negative electrode active material of lithium-containing silicon oxide represented by the compositional formula Li_xSiO_y , and a positive electrode active material of lithium-containing titanium oxide represented by the general formula $\text{Li}_x\text{Ti}_y\text{O}_4$ or lithium-containing iron sulfide represented by the general formula Li_xFeS_y .

In addition, the lithium metal oxide material disclosed in Watanabe '644 for use in making the negative electrode can readily absorb water, unlike the carbonaceous material which the negative electrode active substance recited in claim 1 comprises. Watanabe discloses that the drying or moisture-eliminating temperature is preferably in the range of 80 to 350 degrees C, and more preferably 100 to 250 degrees C. Watanabe further discloses that the battery is assembled after drying in the above ranges. Heating to more than 200 degrees C is not realistic in a case where a battery is assembled after heating, because binder contained in the electrode would normally be decomposed or would deteriorate at such temperatures.

The Supplemental Examiner's Answer further contains a statement that ". . . Kurose specifically identifies 'nickel-containing lithium composite oxides' as 'tend[ing] to absorb moisture'" and a statement that nickel-containing lithium composite oxides "can be considered to be substantially equivalent to LiMn_2O_4 ." It is well-known that different chemical materials tend to have their own set of properties, and that in order to make a statement that different materials are "equivalent" with regard to one or more properties, it is necessary to provide evidence of such equivalence. The Declaration Under 37 C.F.R. §1.132¹ (which was entered in this application on

¹In the Supplemental Examiner's Answer, there is a statement that ". . . the declaration [i.e., the Declaration Under 37 C.F.R. §1.132 (which was entered in this application on July 22, 2005)] was not discussed in the Appeal Brief. The reason the Declaration was not

July 22, 2005), provides evidence that nickel-containing lithium composite oxides *do not* behave in a manner which is equivalent to LiMn_2O_4 . In this Declaration, in Experiment 1, electrolyte solution was heated in order to analyze the amount of HF contained in the respective electrolyte solutions after heating. In Experiment 2, respective positive electrode materials (LiNiO_2 and LiMn_2O_4) were placed in respective electrolyte solutions, and the electrolyte solutions were then heated as in Experiment 1, after which the amount of transition metal in the electrolyte solution was detected. Experiment 1 demonstrates that HF is generated by heating the electrolyte solution, similar to the way in which HF is generated by addition of water into the electrolyte solution. HF is believed to enhance the dissolution of transition metals. Table 2 shows that the rate of dissolution of Mn from LiMn_2O_4 is much higher than the rate of dissolution of Ni from LiNiO_2 , indicating that the amount of dissolution of transition metal into the electrolyte solution strongly depends on the type of positive electrode material (i.e., whether it is LiNiO_2 or LiMn_2O_4).

Finally, on page 8 of the Supplemental Examiner's Answer, lines 4-10, the U.S. PTO apparently asserts that because LiMn_2O_4 and LiNiO_2 are both listed as compounds which can be used for the positive electrode active substance according to the present invention somehow means that those two materials are "similar". Such an implication is improper. The mere fact that LiMn_2O_4 and LiNiO_2 are both listed as compounds which can be used for the positive electrode active substance according to the present invention provides no basis whatsoever for asserting that those two materials are "similar".

* * * * *

In view of the above, and the Reply Brief on February 21, 2006 and the Brief on Appeal filed on November 14, 2005, the Honorable Board of Patent Appeals and Interferences is respectfully requested to reverse the final rejection of claims 1-17, and to pass this application to allowance and issuance.

discussed in the Appeal Brief was because Kurose '822 apparently was not applied in the rejection set forth in the Final Office Action, and because the Declaration was submitted to demonstrate the flaws in arguments advanced by the U.S. PTO which were based on Kurose '822.

The Commissioner is hereby authorized to charge any additional fees associated with this communication or credit any overpayment to Deposit Account No. 50-1446.

Respectfully submitted,
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